PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference ASK075BWO	**FOR FURTHER ACTION**	See Form PCT/IPEA/416
International application No. PCT/EP2004/009405	International filing date *(day/month/year)* 23.08.2004	Priority date *(day/month/year)* 22.08.2003
International Patent Classification (IPC) or national classification and IPC F04B49/025, F04B23/02		
Applicant ASKOLL HOLDING S.R.L. et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 4 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
21.03.2005	07.10.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Gnüchtel, F Telephone No. +49 89 2399-2012

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/009405

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages	
2-7	as originally filed
1, 1a	received on 24.06.2005 with letter of 22.06.2005
Claims, Numbers	
1-11	filed with telefax on 26.09.2005
Drawings, Sheets	
1/6-6/6	as originally filed

   ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/009405

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-11
	No: Claims	
Inventive step (IS)	Yes: Claims	1-11
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-11
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step and industrial applicability

V.1 Document **DE 36 07 466 A1 (= D1)**, considered the closest prior art, discloses a synchronous immersion pump equipped with a float control device and comprising a synchronous electric motor with a permanent magnet rotor, wherein the float of said control device is incorporated in a chamber of an envelope externally associated with the body of the pump.

The subject-matter of independent claim 1 differs from the pump as disclosed in document **D1** in that the envelope comprises a base which is rotatably mounted on the pump body, and a sensor element of the control device is housed in said body in correspondence with said base, and wherein the float is moving freely inside the chamber inside the base along an axis which is either coincident or misaligned with a vertical axis of the sensor element, depending on the position of the base.

The technical problem to be solved by this distinguishing feature is the provision of an immersion pump having a float control device, wherein different pump operation modes may be selected with the help of said control device.

The solution as defined by the combination of features of claim 1 allows to select between an operation mode, wherein the float control is active, and a mode, wherein the pump is operable independently of the float switch, by turning the base into a position where the moving axis of the float does not match the vertical axis of the Hall sensor anymore. This constructional realization of a variable pump float switch is not known from document **D1** or from any of the documents cited in the international search report. Typically the chambers for the float are fixedly attached to the pump: This is shown in the cited documents. Hence, the claimed subject-matter does also not appear to be rendered obvious by any of these documents alone or in combination.

The subject-matter of independent claim 1 therefore fulfills the requirements of the PCT with respect to novelty and inventive step.

V.2 Dependent claims 2 to 11 are referring back to claim 1, and hence their subject-matter

appears to be also new and inventive in the sense of the PCT.

V.3 The claimed synchronous pump is considered to be industrially applicable in the sense of Article 33(4) PCT, for example for draining purposes in the technical fields of sewage collection or civil works.

Title: Immersion pump equipped with a float control device.

Field of application

In its more general aspect the present invention relates to an immersion pump driven by a permanent-magnet synchronous electric motor and particularly, but not exclusively, suitable for a submersed installation in drain basins or tanks or in a sewage floodway.

More particularly, the invention relates to a synchronous pump structure, particularly an immersion pump equipped with a float control device and comprising a synchronous electric motor with a permanent-magnet rotor.

Prior art

As it is well known to the skilled in the art, immersion pumps are used to rapidly pump down sewage collection tanks or however when fluids flowing in a recess are to be discharged, whose draining requires the fluid to exceed a given head.

A typical application in the civil field is represented by pumping down sewage collection basins or tanks positioned in underground rooms located at a lower level than the corresponding sewerage network.

Other applications occur in the building field for dumping down water-wells formed after digging for making foundations.

A float control device comprising a level sensor of the fluid to be discharged is generally associated to an immersion pump; the sensor allows the pump to be turned on when the fluid level is kept above a predetermined threshold and the pump to be turned off when the fluid level reaches a minimum value.

The German patent n° DE 3607466A describes a unit pump with a float level regulator housed in a guide located parallel to the body of the pump. The guide guides the float in its displacements. The float comprises at least one magnet (15), which acts at least on a Hall generator controlling the triggering of the regulator. A control device connects the Hall generator and switches provided for monitoring pump functions:

switch-on and switch-off.

Such pumps are advantageously realised with permanent-magnet synchronous motors which are cheap and very reliable and they have the only drawback of a difficult turn-on due to the need to overcome the initial load inertia before reaching a steady synchronism state.

Several solutions can be adopted to remove this drawback by providing for example the use of convenient electronic driving circuits, or by providing

CLAIMS

1. A synchronous pump structure, particularly an immersion pump (1) equipped with a float control device (3) and comprising a synchronous electric motor (2) with a permanent-magnet rotor (8), characterised in that the float (16) of said control device (3) is incorporated in a chamber of an envelope (11), externally associated with the body (15) of the pump (1), said envelope (11) comprising a base (13) rotary mounted on said body (15) and a sensor element (4) of said control device (3) is housed in said body (15) in correspondence with said base (13), said float (16) is moving freely inside said chamber providing in a reciprocal separation and approach with said sensor element (4) along an axis coincident or misaligned with a vertical axis of said sensor element (4) in according to said base (13) position.

2. A pump structure according to claim 1, characterised in that said sensor element is a level sensor (4) of the Hall-effect magnetic type.

3. A pump structure according to claim 1, characterised in that said float (16) is equipped in its lower part with a permanent magnet (19).

4. A pump structure according to claim 1, characterised in that said envelope (11) comprises said base (13) that is a cylindrical-cup-shaped portion and a lid (20) defining with said base portion (13) said closed chamber.

5. A pump structure according to claim 4, characterised in that the lid (20) comprises a knob (22) which can be handled by a user to adjust the position of the float (16) on the horizontal plane.

6. A pump structure according to claim 2, characterised in that said Hall effect sensor (4) comprises a probe (27) mounted on an electronic board housed in the pump body (15) in a position underlying the float (16).

7. A pump structure according to claim 4, characterised in that said base portion (13) has a side wall (23) equipped with a grate (29) to put the internal part of the envelope (11) in fluid communication with the external environment.

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8. A pump structure according to claim 7, characterised in that internally, close to that side portion (23), a semi-cylinder-shaped filter element (14) is provided.

9. A pump structure according to claim 8, wherein said filter (14) is kept in position by two opposite bulkheads (24, 30) partially projecting towards the internal part of the envelope (11).

10. A pump structure according to claim 2, wherein the position of the float (16) can be manually adjusted in order to be misaligned with respect to said sensor element (4).

11. A pump structure according to one or more previous claims, characterised in that said envelope (11) is located in an upper part (12) of said pump body (15).